Sample Research Abstract

ABSTRACT

Thermophoresis and its Thermal Parameters for Aerosol Collection. ZHUO F. HUANG (Sacramento State University, Sacramento, CA 95819) MICHAEL G. APTE (Lawrence Berkeley National Laboratory, Berkeley, CA 94720).

The particle collection efficiency of a prototype environmental tobacco smoke (ETS) sampler based on the use of thermophoresis is determined by optimizing the operational voltage that determines its thermal gradient. This sampler's heating element was made of three sets of thermophoretic (TP) wires 25 μm in diameter suspended across a channel cut in a printed circuit board and mounted with collection surfaces on both sides. The separation between the heating element and the room temperature collection surface was determined in a numerical simulation based on the Brock-Talbot model. Other thermal parameters of this TP ETS sampler were predicted by the Brock-Talbot model for TP deposition. From the normalized results the optimal collection ratio was expressed in terms of operational voltage and filter mass. Prior to the Brock-Talbot model simulation for this sampler, 1.0 V was used arbitrarily. The operational voltage was raised to 3.0 V, and the collection efficiency was increased by a factor of five for both theory and experiment.